

The Swift SFXT monitoring campaign: the IGR J16479-4514 outburst in 2009

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Abstract.

IGR J16479-4514 is a member of the Supergiant Fast X-ray transient (SFXT) class. We present the light curves of its latest outburst, which occurred on January 29, 2009. During this outburst, IGR J16479-4514 showed prolonged activity lasting several days. The presence of eclipses was successfully tested.

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THE OUTBURST ON 2009 FEBRUARY

The *Swift*/BAT caught a new outburst from the Supergiant Fast X-ray Transient IGR J16479-4514 on January 29 [1]. *Swift* slewed to the target so that the XRT started observing the field at 06:46:46.9 UT, 819.3 s after the BAT trigger. In the days following the outburst, the source was regularly monitored with *Swift*/XRT, and showed renewed activity on 2009 February 8 [2]. The XRT data were sought for the presence of eclipses, as suggested by [3]. Using the ephemeris from [4], we selected the events inside and outside the eclipses, where by ‘inside the eclipse’ we consider the time interval between the start of the eclipse as defined by [3] and 0.6 d later. We obtain a net count rate of $(6 \pm 3) \times 10^{-3}$ counts s⁻¹ (inside) and 0.203 ± 0.003 counts s⁻¹ (outside). This indicates that the source is in two distinct flux levels inside and outside the predicted times of the eclipses at the $\sim 50\sigma$ level. Consistent results are obtained examining the data of the whole 2008 XRT campaign. We can thus conclude that the XRT data are consistent with the presence of an eclipse on the longest baseline so far examined.

DISCUSSION

The 3.32 days periodicity [4], if interpreted as the orbital period of the binary system, is very difficult to reconcile with the mechanisms proposed to explain the SFXTs phe-

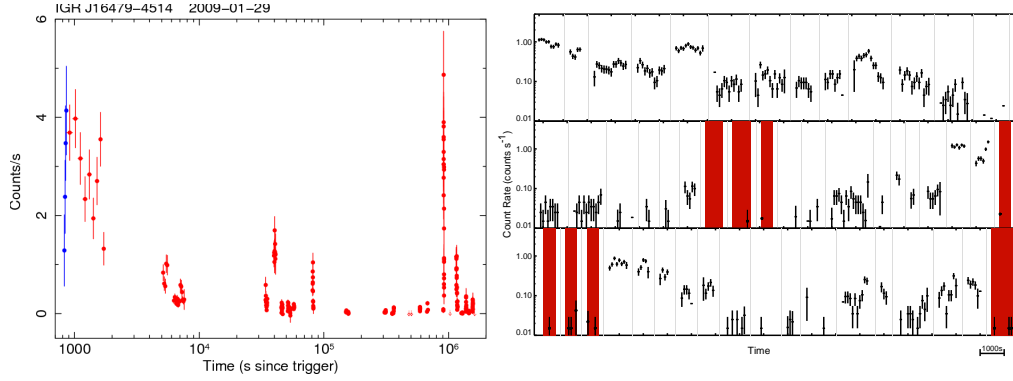


FIGURE 1. **Left Panel:** *Swift*-XRT (0.2-10 keV) lightcurve of the January 29 outburst of IGR J16479-4514. **Right Panel:** Montage of the outburst time sequences. Non-observing intervals and orbital gaps have been cut out from the time axis and replaced by thick grey vertical bars. The red strips mark the position of the predicted eclipse times. Each point represents a 100 s time bin. As a reference, on the bottom-right we show the 1000s time unit.

nomenon. We can compare the out-of-eclipse average X-ray luminosity ($L_{\text{obs}} \lesssim 10^{35} \text{ erg s}^{-1}$) with the X-ray emission expected from Bondi-Hoyle accretion onto a neutron star. Assuming a circular orbit and a set of realistic physical parameters for the binary system [5], the expected X-ray luminosity is $\sim 10^{37} \text{ erg s}^{-1}$, about 2–3 order of magnitude higher than the observed value, that, on the other hand, can be obtained only at a wind mass loss rate of $\dot{M} \lesssim 10^{-9} M_{\odot} \text{ yr}^{-1}$ (which is not reasonable for a O8.5 supergiant). A viable explanation to this inconsistency could be that the 3.32 days periodicity is not orbital, but it is the time interval between the periodically recurrent flares when the neutron star passes through the preferential plane for the outflowing wind from the supergiant; thus, the true orbital period can be much longer than this periodicity [6].

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